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United States Court of Appeals,
Federal Circuit.
VITRONICS CORPORATION, Plaintiff-Appellant,
v.
CONCEPTRONIC, INC., Defendant-Appellee.
No. 96-1058.

July 25, 1996.

Patentee brought action against competitor, alleging infringement of its patented method for reflow soldering of surface mounted devices to printed circuit boards. The United States District Court for the District of New Hampshire, Martin F. Loughlin, J., entered judgment in favor of competitor, and patentee appealed. The Court of Appeals, Michel, Circuit Judge, held that: (1) "solder reflow temperature" within meaning of patent meant peak reflow temperature, rather than "liquidus temperature," and (2) trial court erred in relying on expert testimony in interpreting claim.

Reversed and remanded.

West Headnotes

[1] **Patents** 226.6
291k226.6 Most Cited Cases
Literal patent infringement analysis involves two steps: proper construction of asserted claim and determination as to whether accused method or product infringes asserted claim as properly construed.

[2] **Patents** 314(5)
291k314(5) Most Cited Cases

[2] **Patents** 324.5
291k324.5 Most Cited Cases
Patent claim construction is matter of law, which Court of Appeals reviews de novo.

[3] **Patents** 165(2)
291k165(2) Most Cited Cases

[3] **Patents** 167(1)
291k167(1) Most Cited Cases

[3] **Patents** 168(2.1)
291k168(2.1) Most Cited Cases
In interpreting asserted patent claim, court should look first to intrinsic evidence of record, i.e., patent itself, including claims, specification and if in evidence, prosecution history; such intrinsic evidence is most significant source of legally operative meaning of disputed claim.

[4] **Patents** 165(2)
291k165(2) Most Cited Cases
In interpreting patent claim, Court of Appeals first looks to words of claims themselves, both asserted and nonasserted, to define scope of patented invention.

[5] **Patents** 162
291k162 Most Cited Cases
Although words in patent claim are generally given their ordinary and customary meaning, patentee may choose to be his or her own lexicographer and use terms in manner other than their ordinary meaning, as long as special definition of term is clearly stated in patent specification or file history.

[6] **Patents** 167(1.1)
291k167(1.1) Most Cited Cases
In interpreting patent claim, it is always necessary to review specification to determine whether inventor has used any terms in manner inconsistent with their ordinary meaning; specification acts as a dictionary when it expressly defines terms used in claims or when it defines terms by implication.

[7] **Patents** 167(1)
291k167(1) Most Cited Cases
Patent specification contains written description of invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it; thus, specification is always highly relevant to claim construction analysis.

[8] **Patents** 167(1)
291k167(1) Most Cited Cases
Usually, specification is dispositive when discovering patent claims; it is single best guide to meaning of disputed term.

[9] **Patents** 168(2.1)
291k168(2.1) Most Cited Cases
Court may consider prosecution history of patent, if

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in evidence, in interpreting patent claim.

[10] Patents 168(2.1)
291k168(2.1) Most Cited Cases
"Prosecution history" contains complete record of all proceedings before Patent and Trademark Office (PTO), including any express representations made by patent applicant regarding scope of claims; as such, record before PTO is often of critical significance in determining meaning of claims.

[11] Patents 168(1)
291k168(1) Most Cited Cases
Included within analysis of file history, when interpreting patent claim, may be examination of prior art cited therein.

[12] Patents 159
291k159 Most Cited Cases
In most situations, analysis of intrinsic evidence alone will resolve any ambiguity in disputed patent claim term; in such circumstances, it is improper to rely on extrinsic evidence.

[13] Patents 159
291k159 Most Cited Cases
In those cases where public record unambiguously describes scope of patented invention, reliance on any extrinsic evidence is improper.

[14] Patents 159
291k159 Most Cited Cases
Claims, specification, and file history, rather than extrinsic evidence, constitute public record of patentee's claim, record on which public is entitled to rely.

[15] Patents 227
291k227 Most Cited Cases
Competitors are entitled to review public record, apply established rules of claim construction, ascertain scope of patentee's claimed invention and, thus, design around claimed invention.

[16] Patents 101(2)
291k101(2) Most Cited Cases
"Solder reflow temperature" within meaning of patent for reflow soldering of surface mounted devices to printed circuit boards, meant peak reflow temperature, rather than "liquidus temperature," where preferred embodiment in specification would have fallen outside scope of claim if term was meant to mean "liquidus temperature."

[17] Patents 165(1)
291k165(1) Most Cited Cases
Interpretation of patent so that preferred embodiment falls outside of patent claim is rarely, if ever, correct and would require highly persuasive evidentiary support.

[18] Patents 159
291k159 Most Cited Cases
Even if trial judge permissibly decided to hear all possible evidence before construing patent claim, expert testimony, which was inconsistent with specification and file history, should have been accorded no weight.

[19] Patents 159
291k159 Most Cited Cases
In instances in which intrinsic evidence is insufficient to enable court to determine meaning of certain patent claims, extrinsic evidence may also properly be relied on to understand the technology and to construe claims.

[20] Patents 159
291k159 Most Cited Cases
"Extrinsic evidence" is that evidence which is external to patent and file history, such as expert testimony, inventor testimony, dictionaries, and technical treatises and articles.

[21] Patents 159
291k159 Most Cited Cases
Extrinsic evidence in general, and expert testimony in particular, may be used only to help court come to proper understanding of patent claims; it may not be used to vary or contradict claim language.

[22] Patents 159
291k159 Most Cited Cases
Extrinsic evidence may not contradict import of other parts of patent specifications.

[23] Patents 159
291k159 Most Cited Cases
Where patent documents are unambiguous, expert testimony regarding meaning of claim is entitled to no weight.

[24] Patents 162
291k162 Most Cited Cases
Testimony concerning inventor's objective intent as to claim's scope, when unexpressed in patent documents, cannot guide court to proper

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interpretation of patent when patent documents themselves do so clearly.

[25] Patents 161
291k161 Most Cited Cases
Court in its discretion may admit and rely on prior art proffered by one of the parties, whether or not cited in specification or file history, when interpreting patent; this prior art can often help to demonstrate how disputed claim term is used by those skilled in the art.

[26] Patents 159
291k159 Most Cited Cases
As compared to expert testimony, which often only indicates what particular expert believes patent term means, prior art references may be more indicative of what all those skilled in art generally believe certain term means; reliance on such evidence is unnecessary and improper, however, when disputed terms can be understood from careful reading of public record.

[27] Patents 167(1.1)
291k167(1.1) Most Cited Cases

[27] Patents 168(2.1)
291k168(2.1) Most Cited Cases
Prior art may not be used to vary patent claim terms from how they are defined, even implicitly, in specification or file history.

[28] Patents 162
291k162 Most Cited Cases
Regardless of how those skilled in the art would interpret patent term in other situations, where those of ordinary skill, on reading of patent documents, which conclude that documents preclude term being given meaning propounded by expert witness, court must give it meaning indicated by patentee in patent claim, specification and file history.

[29] Patents 159
291k159 Most Cited Cases
Trial court erred in considering extrinsic evidence when determining meaning of claim term "solder reflow temperature" in patent for method of reflow soldering of surface mounted devices to printed circuit boards, where specification clearly and unambiguously defined term.

[30] Patents 159
291k159 Most Cited Cases
Prior art documents and dictionaries are to be preferred over opinion testimony, whether by attorney or by artisan in field of technology to which patent is directed, when interpreting patent claim.

Patents 328(2)
291k328(2) Most Cited Cases
4,654,502. Cited.
***1578** James J. Foster, Wolf, Greenfield & Sacks, P.C., Boston, Massachusetts, argued, for plaintiff-appellant. With him on the brief were Lawrence M. Green and Brett N. Dorny.

Paul J. Hayes, Weingarten, Schurgin, Gagnebin & Hayes, Boston, Massachusetts, argued, for defendant-appellee. With him on the brief was Dean G. Bostock.

Before MICHEL and LOURIE, Circuit Judges, and FRIEDMAN, Senior Circuit Judge.

MICHEL, Circuit Judge.

Vitronics Corporation ("Vitronics") appeals the September 27, 1995 order of the United States District Court for the District of New Hampshire, Civil Action No. 91-696-L, entering judgment as a matter of law that Vitronics did not prove that Conceptronic, Inc. ("Conceptronic") infringed claim 1 of U.S. Patent No. 4,654,502 ("the '502 patent"). The appeal was submitted for decision after oral argument on May 8, 1996. Because we conclude that the specification of the '502 patent dictates a claim interpretation in accordance with the plaintiff's proposed construction, and that, so construed, the '502 patent may have been infringed, we reverse the trial court's decision and remand for further proceedings.

BACKGROUND

The Patented Invention

Vitronics and Conceptronic both manufacture ovens used in the production of printed ***1579** circuit boards. The ovens are used to solder electrical devices (such as resistors, capacitors and integrated circuits) to the boards. Several methods of soldering devices to boards have been developed; the '502 patent, assigned to Vitronics, is directed to one of those methods.

Specifically, the '502 patent is directed to a method for the reflow soldering of surface mounted devices to a printed circuit board in which the circuit board is moved by a conveyor through a multizone oven. In this process, a solder paste is placed on the circuit board and the devices to be soldered (with attached

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connectors) are placed on the paste. The circuit board is then placed on what is basically a conveyor belt running through an oven and passing through several different heating zones. In the final and hottest zone, the solder paste melts and forms a connection between the device and the circuit board. The boards remain in the last heating zone for only a short duration, allowing the solder to reach a temperature high enough to cause the solder to melt and reflow while maintaining the devices themselves below the solder reflow temperature. Due to this temperature differential, the solder flows up the device connectors to form a solid connection.

Claim 1 of the '502 patent, the only claim at issue in this appeal, reads as follows (with added emphasis on the disputed terms):

> 1. A method for reflow soldering of surface mounted devices to a printed circuit board comprising:
> moving a printed circuit board having solder and devices disposed on a surface thereof through a first zone and in close proximity to a first emitting surface of at least one nonfocused infrared panel emitter, said first emitting surface being at a first panel temperature;
> moving said board through a second zone and in close proximity to a second emitting surface of at least one nonfocused infrared panel emitter, said second emitting surface being at a second panel temperature lower than said first panel temperature; and
> moving said board through a third zone and in close proximity to a third emitting surface of at least one nonfocused infrared panel emitter, said third emitting surface being at a third panel temperature higher than said second panel temperature, said third emitting surface heating said board and said solder to *a solder reflow temperature* for a period of time sufficient to cause said solder to reflow and solder said devices to said board while maintaining the temperature of said devices below *said solder reflow temperature.*

Proceedings Before the District Court

This action was brought on November 26, 1991 by Vitronics against Conceptronic for infringement of both the '502 patent and U.S. Patent No. 4,833,301 ("the '301 patent"). [FN1] At the time the suit was filed, Conceptronic was selling the "Mark series" line of ovens. Conceptronic later discontinued the Mark series and began selling the "HVC series" line of ovens. Prior to trial, the parties stipulated that every limitation of claim 1 of the '502 patent was met by the HVC series of ovens, except the limitation requiring the utilization of "nonfocused infrared panel emitters" and the limitation that the temperature of the devices must be maintained below the "solder reflow temperature." [FN2]

> FN1. A jury returned a verdict of non-infringement of the '301 patent. Vitronics does not appeal that verdict.
>
> FN2. Whether the Conceptronic ovens utilize nonfocused infrared panel emitters is not before this court.

Vitronics, by way of a request for a jury instruction, asked the court to construe the meaning of the "solder reflow temperature" limitation. The specific instruction sought by Vitronics was as follows:

> In considering the question of whether the '502 method patent has been infringed by the Mark and HVC Series ovens, you have to decide whether, in use, those ovens maintain the temperature of the devices below the solder reflow temperature. The phrase "solder reflow temperature" in the '502 patent means the temperature reached by the solder during the period it is reflowing during the final stages of the ***1580** soldering process, sometimes referred to as the "peak solder reflow temperature." It does not mean the "liquidus temperature," the temperature at which the solder first begins to melt. Thus, if the temperature of the devices stays below that of the solder, the '502 method patent is infringed by the Mark and HVC Series ovens.

Thus, Vitronics contended that, as used in the claim, solder reflow temperature means peak reflow temperature, *i.e.,* a temperature approximately 20° C above the liquidus temperature, at which the solder is completely melted and moves freely. Conceptronic, on the other hand, contended that solder reflow temperature means 183° C, *i.e.,* the liquidus temperature of a particular type of solder known as 63/37 (Sn/Pb) solder. [FN3]

> FN3. The specification of the '502 patent describes three exemplary types of solder which can be used in the solder reflow process-- 60/40 (Sn/Pb), 63/37 (Sn/Pb) and 62/36/2 (Sn/Pb/Ag)--each of which, it indicates, has a liquidus temperature of about 190° C and a peak reflow temperature of about 210° to 218° C. At trial, the parties appear to have discussed only 63/37 (Sn/Pb) solder, which has a liquidus temperature of 183° C. However, the claims are not limited to that particular

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> solder or a solder with that particular liquidus temperature.

The district court delayed construing the disputed language until the close of testimony, at which time it ruled in favor of Conceptronic and concluded that the term "solder reflow temperature" as used in claim 1 refers to 183°>>>>>C. Vitronics then conceded that the court was required to grant judgment as a matter of law in favor of Conceptronic, as Vitronics had not presented any evidence of infringement under the court's interpretation of solder reflow temperature. This appeal followed.

Claim Construction Aids Before the District Court

In spite of Vitronics' early request for a jury instruction on the proper claim construction, the district court delayed announcing its claim construction until hearing all the evidence put forth at trial. During trial, and in their briefs to the district court in support of their respective claim constructions, the parties discussed the patent specification, expert testimony, prior testimony and writings of Vitronics and its employees, and technical references. The most pertinent materials are discussed below.

The Patent Specification

Vitronics relied heavily upon the patent itself to support its asserted claim construction. Although Vitronics conceded that the term "solder reflow temperature" may be ambiguous when considered in isolation, it argued that the specification clearly shows that, as used in the claim, solder reflow temperature means peak reflow temperature rather than the liquidus temperature. In particular, Vitronics pointed to that part of the specification that describes a preferred embodiment:

> A preferred embodiment of the invention for reflow soldering of surface mounted devices to printed circuit boards will now be described. The printed circuit boards are typically made of epoxy-glass, such as fire retardant 4(FR-4), or polyamide glass. These boards typically degrade above temperatures of 225° C. The solder may be, for example, 60/40 (Sn/Pb), 63/37 (Sn/Pb), or 62/36/2 (Sn/Pb/Ag), all of which have a liquidus temperature (i.e. begin to melt) of about 190° C. and a peak reflow temperature of about 210°-218° C. Thus, to effect reflow soldering without damaging the board, the solder must be allowed to reach a temperature of at least 210° C., but the board cannot reach a temperature of 225° C.
>
>
>
> The board is then sent into a fifth zone 5 to bring the temperature of the board up to a temperature of approximately 210° C., the devices up to approximately 195° C., and the solder up to approximately 210°>>>>> C. for a period of time of from about 10 to about 20 seconds to cause the solder to flow. Because the devices are cooler than the board, the solder flows up the devices.... The board spends approximately 60 seconds in the fifth zone, but only about 10 to 20 seconds at 210° C. Thus, the board is at the solder reflow temperature for only a short period of time and the ***1581** devices never reach the solder reflow temperature.

Vitronics pointed out that, in the example described as the preferred embodiment, the temperature of the solder is raised to 210° C, the peak reflow temperature, and the temperature of the devices is raised to 195°>>>>> C, 5° above the 190° C liquidus temperature. Thus, as argued by Vitronics, the term "solder reflow temperature" must be construed so that it refers to the peak reflow temperature because the claim requires that the temperature of the devices be maintained below "said solder reflow temperature"; if solder reflow temperature were construed to refer to liquidus temperature, the preferred embodiment would not be covered by the patent claims.

Expert Testimony

Conceptronic relied heavily on the expert testimony of Dr. Rothe. Dr. Rothe testified that the meaning of the term "solder reflow temperature" in claim 1 is synonymous with liquidus temperature. Dr. Rothe further testified that the solder reflow temperature for 63/37 (Sn/Pb) is 183° C. Dr. Rothe likewise testified at trial that several technical articles written by those skilled in the art supported his view that solder reflow temperature refers to liquidus temperature.

The Testimony of Mr. Hall

Conceptronic also relied on the testimony of Mr. Hall, the Chief Engineer at Vitronics. At trial, Mr. Hall confirmed that during his deposition he had testified that the reflow temperature of solder was 183°> C. Mr. Hall also testified that, during his deposition, he had used solder reflow temperature to refer to liquidus temperature. However, at another point in his trial testimony, Hall explained that, while in his earlier deposition testimony he had used solder reflow temperature to refer to liquidus temperature,

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he did not suggest that was how the term was used in the patent. Rather, Hall testified the patent uses the term to refer to the peak reflow temperature.

Paper Written By Former Vitronics Employee

Conceptronic also introduced into evidence a paper written by Phillip Zarrow, a former employee of Vitronics, defining solder reflow temperature in the following manner: "As the temperature of the solder paste on the interconnect passes the solder alloy's melting point and the solder enters a molten state, the assembly enters the reflow region of the process. For 63 Sn/37 Pb, a eutectic solder and the most common SMT alloy, reflow occurs at 183° C." Phillip Zarrow, *Convection/Infrared and Convection Dominant Reflow Soldering of Fine Pitch SMT Devices,* § 10.3.3 (1994). However, that same paper later describes the solder reflow process as taking the temperature of the solder above liquidus: "Most solder manufacturers recommend bringing the interconnection temperature approximately 15 to 25° C above the alloy melting point to achieve full liquidus and assure good solder flow and aid fillet formation." *Id.*

Memorandum of Plaintiff Vitronics Corporation in Opposition to Motion for Summary Judgment of Defendant Conceptronic Corporation and In Support of Plaintiff's Cross-Motion for Summary Judgment of Patent Validity and Infringement

In its brief supporting its proposed construction of claim 1, both at the trial court level and here on appeal, Conceptronic similarly relied on a memorandum written by Vitronics which contains the following language: "Tin/lead solders commonly used by the electronic products industry have a 'liquidus' or 'reflow' temperature in the order of 183° C, or about 361° F." However, this phrase is in the background section of the memorandum and later in the same memorandum, Vitronics discussed the issue of infringement as being whether the temperature of the devices was maintained below "the temperatures of the leads at which the solder is reflowing."

Without indicating which evidence it relied upon, the district court simply ruled that solder reflow temperature meant 183° C.

ANALYSIS

The Use of Intrinsic and Extrinsic Evidence in Claim Construction

[1][2] A literal patent infringement analysis involves two steps: the proper construction ***1582** of the asserted claim and a determination as to whether the accused method or product infringes the asserted claim as properly construed. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976, 34 USPQ2d 1321, 1326 (Fed.Cir.1995) (in banc), *aff'd,* 517 U.S. 370, ----, 116 S.Ct. 1384, 1393, 134 L.Ed.2d 577 (1996); *Hormone Research Found., Inc. v. Genentech, Inc.*, 904 F.2d 1558, 1562, 15 USPQ2d 1039, 1042 (Fed.Cir.1990), *cert. dismissed,* 499 U.S. 955, 111 S.Ct. 1434, 113 L.Ed.2d 485 (1991). The first step, claim construction, is a matter of law, which we review *de novo. Markman,* 52 F.3d at 979, 34 USPQ2d at 1329. Claim construction is the only step in the infringement analysis at issue in this appeal. [FN4]

> FN4. No assertion was made that defendant infringed under the doctrine of equivalents.

In determining the proper construction of a claim, the court has numerous sources that it may properly utilize for guidance. These sources have been detailed in our previous opinions, as discussed below, and include both intrinsic evidence (*e.g.,* the patent specification and file history) and extrinsic evidence (*e.g.,* expert testimony).

[3] It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, *i.e.,* the patent itself, including the claims, the specification and, if in evidence, the prosecution history. *See Markman,* 52 F.3d at 979, 34 USPQ2d at 1329. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language.

[4][5] First, we look to the words of the claims themselves, both asserted and nonasserted, to define the scope of the patented invention. *See Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620, 34 USPQ2d 1816, 1819 (Fed.Cir.1995). Although words in a claim are generally given their ordinary and customary meaning, a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning, as long as the special definition of the term is clearly stated in the patent specification or file history. *Hoechst Celanese Corp. v. BP Chems. Ltd.*, 78 F.3d 1575, 1578, 38 USPQ2d 1126, 1129 (Fed.Cir.1996) ("A technical term used in a patent document is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history

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that the inventor used the term with a different meaning.") (citations omitted); *Hormone*, 904 F.2d at 1563, 15 USPQ2d at 1043 ("It is a well-established axiom in patent law that a patentee is free to be his or her own lexicographer and thus may use terms in a manner contrary to or inconsistent with one or more of their ordinary meanings.") (citations omitted).

[6][7][8] Thus, second, it is always necessary to review the specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning. The specification acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication. *Markman*, 52 F.3d at 979, 34 USPQ2d at 1330. As we have repeatedly stated, "[c]laims must be read in view of the specification, of which they are a part." *Id.* at 979, 52 F.3d 967, 34 USPQ2d at 1329. The specification contains a written description of the invention which must be clear and complete enough to enable those of ordinary skill in the art to make and use it. Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.

[9][10][11] Third, the court may also consider the prosecution history of the patent, if in evidence. *Id.* at 980, 52 F.3d 967, 34 USPQ2d at 1330; *Graham v. John Deere*, 383 U.S. 1, 33, 86 S.Ct. 684, 701-02, 15 L.Ed.2d 545, 148 U.S.P.Q. 459, 473 (1966). This history contains the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims. As such, the record before the Patent and Trademark Office is often of critical significance in determining the meaning of the claims. *See Markman*, 52 F.3d at 980, 34 USPQ2d at 1330; ***1583***Southwall Tech., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576, 34 USPQ2d 1673, 1676 (Fed.Cir.1995) ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution.") (citations omitted). Included within an analysis of the file history may be an examination of the prior art cited therein. *Autogiro Co. of America v. United States*, 181 Ct.Cl. 55, 384 F.2d 391, 399, 155 USPQ 697, 704 (1967) ("In its broader use as source material, the prior art cited in the file wrapper gives clues as to what the claims do not cover.").

[12][13][14][15] In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence. *See, e.g., Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1216, 36 USPQ2d 1225, 1228 (Fed.Cir.1995) ("In construing the claims we look to the language of the claims, the specification, and the prosecution history. Extrinsic evidence may also be considered, *if needed* to assist in determining the meaning or scope of technical terms in the claims.") (citations omitted, emphasis added); *Hormone*, 904 F.2d at 1562, 15 USPQ2d at 1043 ("Claim interpretation involves a review of the specification, the prosecution history, the claims (including unasserted as well as asserted claims), and, *if necessary*, other extrinsic evidence, such as expert testimony.") (citations omitted, emphasis added). In those cases where the public record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. The claims, specification, and file history, rather than extrinsic evidence, constitute the public record of the patentee's claim, a record on which the public is entitled to rely. In other words, competitors are entitled to review the public record, apply the established rules of claim construction, ascertain the scope of the patentee's claimed invention and, thus, design around the claimed invention. *See Markman*, 52 F.3d at 978-79, 34 USPQ2d at 1329. Allowing the public record to be altered or changed by extrinsic evidence introduced at trial, such as expert testimony, would make this right meaningless. *See Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("A patentee may not proffer an interpretation for the purposes of litigation that would alter the indisputable public record consisting of the claims, the specification and the prosecution history, and treat the claims as a 'nose of wax.' " (quoting *Senmed, Inc. v. Richard-Allan Med. Indus., Inc.*, 888 F.2d 815, 819 n. 8, 12 USPQ2d 1508, 1512 n. 8 (Fed.Cir.1989))). The same holds true whether it is the patentee or the alleged infringer who seeks to alter the scope of the claims.

The Proper Construction of the Claim Term "Solder Reflow Temperature"

[16][17] As can be readily seen from those portions of the specification set forth above, the meaning of the disputed term "solder reflow temperature" in claim 1 of the '502 patent is clear from a reading of the claim itself and the patent specification. The "peak reflow temperature" and "liquidus temperature" are clearly defined in the specification as having distinctly different meanings. Specifically, for the solders described in the specification, liquidus temperature is about 190° C and the peak reflow

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temperature is about 210° to 218° C. Moreover, in the preferred embodiment described in the patent, the solder is heated to a temperature of 210° C but the temperature of the devices is maintained at approximately 195° C, *i.e.*, below the peak reflow temperature (210° C) but above the liquidus temperature (190°>> C). Therefore, in order to be consistent with the specification and preferred embodiment described therein, claim 1 must be construed such that the term "solder reflow temperature" means the peak reflow temperature, rather than the liquidus temperature. Indeed, if "solder reflow temperature" were defined to mean liquidus temperature, a preferred (and indeed only) embodiment in the specification would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct and would require highly persuasive evidentiary support, which is wholly absent in this case. *See Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1550, 37 USPQ2d 1609, 1612 (Fed.Cir.1996); *see also Hoechst*, 78 F.3d at 1581, 38 USPQ2d at 1130 ("We ***1584** share the district court's view that it is unlikely that an inventor would define the invention in a way that excluded the preferred embodiment, or that persons of skill in this field would read the specification in such a way.").

The District Court's Reliance on Extrinsic Evidence

[18] Since the claim, read in light of the patent specification, clearly uses the term "solder reflow temperature" to mean the peak reflow temperature, rather than the liquidus temperature, that should have been the end of the trial court's analysis. [FN5] Only if there were still some genuine ambiguity in the claims, after consideration of all available intrinsic evidence, should the trial court have resorted to extrinsic evidence, such as expert testimony, in order to construe claim 1. Moreover, even if the judge permissibly decided to hear all the possible evidence before construing the claim, the expert testimony, which was inconsistent with the specification and file history, should have been accorded no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678; *Markman*, 52 F.3d at 983, 34 USPQ2d at 1333.

FN5. The file history was apparently not put into evidence.

[19][20][21][22][23][24] Here, the trial judge considered not only the specification, but also expert testimony and other extrinsic evidence, such as the paper written by the former Vitronics employee. No doubt there will be instances in which intrinsic evidence is insufficient to enable the court to determine the meaning of the asserted claims, and in those instances, extrinsic evidence, such as that relied on by the district court, may also properly be relied on to understand the technology and to construe the claims. *See Markman*, 52 F.3d at 979, 34 USPQ2d at 1329. Extrinsic evidence is that evidence which is external to the patent and file history, such as expert testimony, inventor testimony, dictionaries, and technical treatises and articles. [FN6] *Id.* at 980, 34 USPQ2d at 1330. However, as we have recently re-emphasized, extrinsic evidence in general, and expert testimony in particular, may be used only to help the court come to the proper understanding of the claims; it may not be used to vary or contradict the claim language. *Id.* at 981, 52 F.3d 967, 34 USPQ2d at 1331. Nor may it contradict the import of other parts of the specification. Indeed, where the patent documents are unambiguous, expert testimony regarding the meaning of a claim is entitled to no weight. *Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678. "Any other rule would be unfair to competitors who must be able to rely on the patent documents themselves, without consideration of expert opinion that then does not even exist, in ascertaining the scope of a patentee's right to exclude." *Id.* at 1578, 34 USPQ2d at 1678-79. Nor may the inventor's subjective intent as to claim scope, when unexpressed in the patent documents, have any effect. Such testimony cannot guide the court to a proper interpretation when the patent documents themselves do so clearly.

FN6. Although technical treatises and dictionaries fall within the category of extrinsic evidence, as they do not form a part of an integrated patent document, they are worthy of special note. Judges are free to consult such resources at any time in order to better understand the underlying technology and may also rely on dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents.

[25][26][27] In addition, a court in its discretion may admit and rely on prior art proffered by one of the parties, whether or not cited in the specification or the file history. This prior art can often help to demonstrate how a disputed term is used by those skilled in the art. Such art may make it unnecessary to rely on expert testimony and may save much trial time. As compared to expert testimony, which often

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only indicates what a particular expert believes a term means, prior art references may also be more indicative of what all those skilled in the art generally believe a certain term means. Once again, however, reliance on such evidence is unnecessary, and indeed improper, when the disputed terms can be understood from a careful reading of the public record. *See Kearns v. Chrysler Corp.*, 32 F.3d 1541, 1547, 31 USPQ2d 1746, 1750 (Fed.Cir.1994). Nor may it be used to vary claim terms from how ***1585** they are defined, even implicitly, in the specification or file history.

[28][29] Unfortunately, here the trial judge did use the extrinsic evidence to vary or contradict the manifest meaning of the claims. The trial judge was presented with expert testimony and other evidence that some of those skilled in the relevant art, including certain Vitronics employees, sometimes used the term "solder reflow temperature" and "liquidus temperature" interchangeably. He apparently relied on this testimony in reaching his conclusion that, as used in claim 1, solder reflow temperature meant 183°> C. [FN7] However, regardless of how those skilled in the art would interpret a term in other situations, where those of ordinary skill, on a reading of the patent documents, would conclude that the documents preclude the term being given the meaning propounded by the expert witnesses, we must give it the meaning indicated by the patentee in the patent claim, specification and file history. Thus, expert testimony tending to show that those skilled in the art would, in certain circumstances, understand "solder reflow temperature" to mean the solder liquidus temperature is entitled to no weight in light of the clear contrary meaning shown in the specification. *See Southwall*, 54 F.3d at 1578, 34 USPQ2d at 1678 ("Even if Southwall could show that 'sputter-deposited dielectric' has a meaning to one skilled in the art different from the definition in the '745 specification and file history, the definition in the patent documents controls the claim interpretation."). Because the specification clearly and unambiguously defined the disputed term in the claim, reliance on this extrinsic evidence was unnecessary and, hence, legally incorrect.

> FN7. Although the trial judge's reasoning does not appear in the record, he must have relied on the testimony presented by Conceptronic that "solder reflow temperature" and "liquidus temperature" were synonymous and the undisputed testimony that the liquidus temperature of 63/37 (Sn/Pb) solder is 183° C.

[30] Had the district court relied on the expert testimony and other extrinsic evidence solely to help it understand the underlying technology, we could not say the district court was in error. But testimony on the *technology* is far different from other expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the *proper construction* of a disputed claim term, relied on by the district court in this case. The latter kind of testimony may only be relied upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms. Such instances will rarely, if ever, occur. Indeed, this case did not present such an instance. Even in those rare instances, prior art documents and dictionaries, although to a lesser extent, are more objective and reliable guides. Unlike expert testimony, these sources are accessible to the public in advance of litigation. They are to be preferred over opinion testimony, whether by an attorney or artisan in the field of technology to which the patent is directed. Indeed, opinion testimony on claim construction should be treated with the utmost caution, for it is no better than opinion testimony on the meaning of statutory terms. *See Markman*, 52 F.3d at 983, 34 USPQ2d at 1332-33 ("First, the testimony of Markman and his patent attorney on the proper construction of the claims is entitled to no deference.... This testimony about construction, however, amounts to no more than legal opinion--it is precisely the process of construction that the court must undertake.").

Other Issues

Conceptronic further argues that, even if we were to reverse the district court's decision regarding the proper interpretation of the term "solder reflow temperature," the district court's ultimate conclusion of no infringement as a matter of law can still be affirmed on the alternative ground that Vitronics' evidence does not prove infringement because Vitronics failed to test the temperature of all of the various devices on the boards and because certain of the Vitronics tests demonstrated that many of the devices reached temperatures above the peak reflow temperature. Vitronics, of course, disputes these assertions and points to supporting documentation to the effect that the Conceptronic ***1586** ovens do indeed maintain the temperature of the devices below peak reflow temperature. The trial court made no decision on this issue. Moreover, such a determination at this stage would require our weighing substantial but conflicting evidence, an

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impermissible exercise for an appellate court. Accordingly, we must remand.

CONCLUSION

For all the foregoing reasons, the judgment of non-infringement as a matter of law is reversed and the case is remanded for further proceedings consistent with this opinion.

REVERSED AND REMANDED.

COSTS

Costs in favor of Vitronics.

90 F.3d 1576, 65 USLW 2124, 39 U.S.P.Q.2d 1573

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